Remarks/Arguments

Examiner Howard Weiss is thanked for the thorough Search and Examination of the Subject Application for Patent.

The second sentence of the paragraph beginning on page 9, line 20 of Specification has been amended to change "The overlap regions 58 are then turned on during the charge integration period." to -- The overlap regions 58 are then turned off during the charge integration period. --. This amendment is to correct a typographical error. The basis for this amendment can be found in the Specification on page 6, lines 13-22; page 8, lines 9-11; and page 9, lines 10-12.

Claim 1 has been amended to emphasize that the deep N well accumulates charge during a charge integration period, the overlap region isolates the N well from the deep N well during the charge integration period, and that the overlap region electrically connects the deep N well to the N well after the charge integration period has been completed. The basis for these amendments to Claim 1 can be found in the Specification on page 6, lines 13-22.

Claims 5-7 have been amended to be consistent with amended Claim 1.

The first line of Claims 8 and 25 have been amended to correct a typographical error by changing "if" to -- of --, as required by the Examiner.

Claim 8 has been amended to emphasize that the deep N well accumulates charge during a charge integration period, the overlap regions isolates the N wells from the deep N well during the charge integration period, and that selected overlap regions electrically connect the deep N well to selected N wells after the charge integration period has been completed. The basis for these amendments to Claim 8 can be found in the Specification on page 6, lines 13-22 and page 7, line 12 to page 8, line 7.

Claims 15-17 have been amended to be consistent with amended Claim 8.

Claim 18 has been amended to emphasize that the deep P well accumulates charge during a charge integration period, the overlap region isolates the P well from the deep P well during the charge integration period, and that the overlap region electrically connects the deep P well to the P well after the charge integration period has been completed. The basis for these amendments to Claim 18 can be found in the Specification on page 6, lines 13-22 and page 10, lines 11-15.

Claims 22-24 have been amended to be consistent with amended Claim 18.

Claim 25 has been amended to emphasize that the deep P wll accumulates charge during a charge integration period, the overlap regions isolates the P wells from the deep P well during the charge integration period, and that selected overlap regions

electrically connect the deep P well to selected P wells after the charge integration period has been completed. The basis for these amendments to Claim 25 can be found in the Specification on page 6, lines 13-22; page 7, line 12 to page 8, line 7; and page 10, lines 11-15.

Claims 32-34 have been amended to be consistent with amended Claim 25.

In the Office Action Summary the Examiner has checked line 9 indicating the "The specification is objected to by the Examiner." However, no specific Objections to the Specification are indicated in the Office Action. It is assumed that line 9 of the Office Action Summary was checked in error and that the Examiner has no Objections to the Specification.

Reconsideration of the Objection to Claims 8 and 25 is requested. Line 1 of Claim 8 and line 1 of Claim 25 have been amended to change "if" to --of--, as required by the Examiner.

Reconsideration of the Rejection of Claims 1-17 under 35 U.S.C. 102(b) as being anticipated by Iwanami et al. (U.S. Pat. No. 4,906,856) is requested. Claims 1-17 are significantly different from the invention of Iwanami et al. for the following reasons. Claims 1-17 describe an active pixel sensor having a P well formed in an N well and a deep N well formed beneath the P well with an overlap region between the N well

and the deep N well, wherein charge is accumulated by the deep N well during a charge integration period. The overlap region is used to isolate the deep N well from the N well during the charge integration period, by depleting the overlap region of charge carriers, and to connect the deep N well to the N well after the charge integration period has been completed, by supplying sufficient charge carriers to the overlap region, so that the charge accumulated by the deep N well during the charge integration period can be transferred to the N well after the charge integration period has been completed.

The invention of Iwanami et al. describes bipolar type photo transistors, drive circuits, and a shift register along a straight line in a semiconductor substrate, column 1, lines 49-55. While, Iwanami et al. shows an N region analogous to the deep N well of Claims 1-17, region 2 in Fig. 2a of Iwanami et al., Iwanami et al. do not show or describe an overlap region which can be depleted or not depleted in order to accumulate charge in a deep N well during a charge integration period, as is described in Claims 1-17. This deep N region, shown as region 2 in Fig. 2a of Iwanami et al., is not available to accumulate charge during a charge integration period because this deep N region can not be isolated from the other N region, region 3 in Fig 2a of Iwanami et al. Iwanami et al. do not describe this deep N region, region 2 in Fig. 2a of Iwanami et al., as capable of accumulating charge during a charge integration period.

Claims 1-17 do not describe a bipolar device, as is described by Iwanami et al. In claims 1-17 charge is accumulated by the deep N well during the charge integration period and held there until being transferred to the N well by changing the

potential barrier of the overlap region. The potential between the P well and N well, as described in Claim 3, or the P well and N wells, as described in Claim 11, determine the potential barrier of the overlap region. Claims 1-17 describe a vertical transfer device which uses a mechanism very similar to the charge transfer mechanism used in CCD devices, but significantly different from the bipolar device described by Iwanami et al.

The deep N well which accumulates charge during a charge integration period and the overlap region which can isolate the deep N well from the N well or connect the deep N well to the N well make Claims 1-17 significantly different from the invention of Iwanami et al. Reconsideration of the Rejection of Claims 1-17, as amended, under 35 U.S.C. 102(b) as being anticipated by Iwanami et al. and allowance of Claims 1-17 are requested.

Reconsideration of the Rejection of Claims 18-34 under 35 U.S.C. 102(b) as being anticipated by Watanabe et al. (U.S. Pat. No. 6,023,293) is requested. Claims 18-34 are significantly different from the invention of Watanabe et al. for the following reasons. Claims 18-34 describe an active pixel sensor having an N well formed in a P well and a deep P well formed beneath the N well with an overlap region between the P well and the deep P well, wherein charge is accumulated by the deep P well during a charge integration period. The overlap region is used to isolate the deep P well from the P well during the charge integration period, by depleting the overlap region of charge carriers, and to connect the deep P well to the P well after the charge integration period has been completed, by supplying sufficient charge carriers to the overlap region, so that

the charge accumulated by the deep P well during the charge integration period can be transferred to the P well after the charge integration period has been completed.

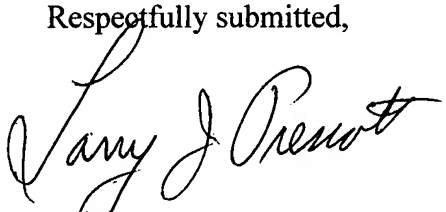
Watanabe et al. describe a solid state imaging device having an image sensor portion and a driving circuit. Watanabe et al. show in the image sensor portion of Figs. 2 and 11 a P well 21 formed in an n type silicon substrate, and an N well, region 24 in Fig. 2, formed in the P well. Watanabe et al. do not show or describe a deep P well distinct from a P well, as is described in Claims 18-34. Watanabe et al. do not show or describe an overlap region between a deep P well and a P well which can be used to either isolate the deep P well from the P well or to connect the deep P well to the P well, as is described in Claims 18-34. Watanabe et al. do not show or describe a distinct deep P well which accumulates charge during a charge integration period while an overlap region can isolate the deep P well from a P well, as is described in Claims 18-34.

Claims 18-34 describe a vertical charge transfer device using a deep P well to accumulate charge during a charge integration period and holding the accumulated charge until being transferred to the P well by changing the potential barrier of the overlap region. The potential between the N well and P well, as described in Claims 22 and 23, or the N well and P wells, as described in Claim 28, determine the potential barrier of the overlap region. Claims 18-34 describe a vertical transfer device which uses a mechanism very similar to the charge transfer mechanism used in CCD devices, but significantly different from the device described by Watanabe et al.

The deep P well which accumulates charge during a charge integration period and the overlap region which can isolate the deep P well from the P well or connect the deep P well to the P well make Claims 18-34 significantly different from the invention of Watanabe et al. Reconsideration of the Rejection of Claims 18-34 under 35 U.S.C. 102(b) as being anticipated by Watanabe et al. and allowance of Claims 18-34 are requested.

It is requested that should Examiner Weiss not find that the Claims are now Allowable that the Examiner call the undersigned Agent at (845)-462-5363 to overcome any problems preventing allowance.

Respectfully submitted,



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